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INDUSTRIAL TEST PROGRAM ADMINISTRATION MANUAL



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INDUSTRIAL TEST PROGRAM ADMINISTRATION MANUAL

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INDUSTRIAL TEST PROGRAM ADMINISTRATION MANUAL

TABLE OF CONTENTS

	Page No.
LIST OF EFFECTIVE PAGES	ii
RECORD OF CHANGES	iii
INDUSTRIAL TEST PROGRAM ADMINISTRATION MANUAL CHANGE REQUEST FORM	v
Section 1 General / References	1
1.1 Purpose.....	1
1.2 Applicability	1
Section 2 Organization Responsibilities	2
2.1 Purpose.....	2
2.2 Responsibility and Authority	2
2.3 Job Descriptions and Responsibilities.....	2
2.4 Joint Test Group (JTG).....	7
Section 3 Test Planning	9
3.1 General.....	9
3.2 Work Package Review and Development.....	9
3.3 Test Requirements Identification and Sequencing.....	9
3.4 Test Procedure Development.....	10
3.5 Test Procedure Review and Issue	11
3.6 Test Procedure Changes.....	11
Section 4 Shipboard Test Execution	12
4.1 General.....	12
4.2 Test Engineering Operating Procedures	12
4.3 Test Readiness Meetings and Reviews	12
4.4 Event Readiness Meetings and Reviews.....	13
4.5 List of Authorized Tests (LAT)	13
4.6 Review of Test Procedures Prior to Performance	13
4.7 Prerequisite Lists	13
4.8 Interface Integration.....	13
4.9 Lead Test Engineer (LTE) Logs	14
4.10 Pre-Shift/Event Briefings.....	14
4.11 Test Interruptions, Undesirable Occurrences and Course of Action Process	14
4.12 Certification of Completed Test Procedures	15
4.13 Metrics	15
4.14 Reliability Testing.....	15
Appendices	
A List of Acronyms	A-1
B Glossary of Terms.....	B-1
C Personnel Qualifications	C-1

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SECTION 1 GENERAL / REFERENCES

REFERENCES

- (a) NAVSEA 0989-028-5000, Manual for the Control of Testing and Plant Conditions (MCT)
- (b) NAVSEA 0905-485-6010, Manual for the Control of Testing and Ship Conditions
- (c) COMFLTFORCOMINST 4790.3, Joint Fleet Maintenance Manual (JFMM)
- (d) NAVSEA S0400-AD-URM-010/TUM, Tag-out Users Manual
- (e) NAVSEAINST 4730.1 (Series); Shipyard Inspection and Required Conditions of Propulsion Plant Systems (Non-Nuclear) on Nuclear Powered Submarines
- (f) NAVSEAINST 4730.2 (Series); Shipyard Inspection and Required Conditions of Propulsion Plant Systems (Non-Nuclear) on Nuclear Powered Surface Ships
- (g) NAVSEA S9213-41-MAN-000, Engineering Department Manual for Naval Nuclear Propulsion Plants

LIST OF APPENDICES

- A List of Acronyms
- B Glossary of Terms
- C Personnel Qualifications

1.1 PURPOSE. This manual establishes requirements for the administrative control of shipboard testing.

1.2 APPLICABILITY. The requirements of this manual apply during naval shipyard CNO-scheduled availabilities, or when specifically invoked by applicable contracts, until start of fast cruise. The requirements of this manual may also be invoked during pre-availability periods assigned to shipyards immediately prior to CNO-scheduled availabilities to provide for an orderly transition to the CNO-scheduled availability and provide maximum training benefit for Ship's Force. This manual may also be invoked whenever the Naval Supervising Activity determines that the scope of work and testing warrants implementation. This manual does not apply to naval reactor plant testing and operations, which are controlled by the requirements of reference (a). This manual does not apply to Ship's Force testing or testing conducted by contractors/AITs except where specifically called out in the manual.

SECTION 2

ORGANIZATION RESPONSIBILITIES

2.1 PURPOSE. This section states the general requirements for shipboard testing. Reference (b), when applicable, takes precedence over this manual.

2.2 RESPONSIBILITY AND AUTHORITY. An essential element for the safe conduct of testing and operations is the establishment of a clearly defined Shipyard test organization(s) for each project, within which a single individual, the Chief Test Engineer (CTE), is designated and recognized as the authority responsible for ensuring that all aspects of testing and operations affected by Shipyard work and testing are being accomplished safely and in accordance with NAVSEA approved requirements and procedures. Therefore, the Shipyard (Naval or private) shall have an organization(s) as described in this section which is the only organization(s) assigned the responsibility and authority for properly maintaining control of shipboard work and testing. The test organization(s) shall ensure that other elements of the Shipyard assigned responsibilities for ship safety are informed of planned tests and operations in a formal manner so that scheduling of operations which could affect ship safety may be coordinated and concurred in where necessary. The Shipyard's Chief Engineer (CHENG) shall be responsible for the operation of the test organization(s) and shall ensure that the test organization(s) carries out its assigned responsibilities. The CHENG shall ensure that qualified personnel in adequate numbers are available to staff the test organization(s).

2.3 JOB DESCRIPTIONS AND RESPONSIBILITIES.

2.3.1 Shipyard.

- a. The Shipyard is responsible for overall administrative direction and coordination of testing, including scheduling and planning. This responsibility includes issue of and compliance with procedures and promulgation of methods for maintaining and controlling conditions and system status relative to all shipboard work and testing (including Ship's Force and Outside Activities) during Shipyard availabilities and construction periods. The Shipyard is responsible for the following:
 - (1) Provide qualified personnel for a test organization(s) to direct shipyard shipboard testing in accordance with approved test procedures and to administer the test program, including the identification, preparation and distribution of availability specific test documents, the collection of test data, and ensuring required testing is accomplished. Shipyard shipboard testing shall be conducted under the direction of a Lead Test Engineer (LTE) or Test Director (TD).
 - (2) Ensure that a process for controlling the accomplishment of all work and testing exists and is adequate to provide safe conditions for the work and testing to be performed.
 - (3) Stop any test or operation and ensure the system is placed in a safe condition when problems develop that have or could result in unsafe conditions.
 - (4) Keep all organizations and elements of the Shipyard informed of the progress of and requirements for testing.
 - (5) Prepare and issue test procedures after obtaining any required approvals and conduct a review of approved procedures prior to performance.

- (6) When NAVSEA approved operating instructions cannot be followed due to maintenance conditions or testing, a temporary procedure shall be presented to the Joint Test Group (JTG) for concurrence. When necessary, assist Ship's Force in the preparation and/or review of temporary operating instructions, which are beyond ship's capability to independently develop. Deviations may be authorized by the organization with operational control (LTE/CTE or Ship's Force) without JTG concurrence if they do not affect ship safety and:
 - a) Are simple in nature and do not significantly effect equipment operational parameters, and
 - b) Do not disable or affect equipment safety devices

Examples include changes in initial lineups to account for portions of systems which are unavailable and not required to support partial system operations, operations without remote indications when provisions are available to locally monitor conditions, modifying system operational alignments to support troubleshooting, etc. These temporary operating procedures will be discontinued when conditions support the use of the NAVSEA approved operating procedures.

- (7) Direct the operation of ship's equipment when the steps for operation are included as specific actions in the test procedure or abnormal operation is required to perform the test procedure.
 - (8) Plan, schedule and administer the shipyard shipboard test program.
 - (9) Prepare and issue prerequisite lists for key events when required.
 - (10) Evaluate shipyard shipboard test results and problems and take appropriate corrective actions.
 - (11) Review all completed shipyard shipboard test procedures and certify that the tests have been satisfactorily completed.
 - (12) Coordinate with Ship's Force and Outside Activities (Alteration Installation Teams (AITs), etc.) the performance of their testing and maintenance that could impact Shipyard work and testing.
 - (13) Ensure that the division of responsibility between the CTEs for each ship is established.
 - (14) Issue local procedures as needed to implement the requirements of this manual.
- b. The Shipyard test organization(s) shall be organized as follows and carry out the duties listed:
- (1) Chief Test Engineer(s) (CTEs) - CTEs shall be appointed in writing for each ship and area of responsibility by the senior Shipyard manager responsible for testing. The CHENG (senior engineering manager in a private Shipyard) shall determine the number and area of cognizance of the CTEs. Assistant Chief Test Engineers (ACTEs) who may act as an alternate to the CTE shall also be designated in writing. The CTE shall report to the senior individual in the Shipyard responsible for testing. The CTE has the responsibility for all testing to the applicable contract and technical requirements as established by NAVSEA. The CTE shall have the authority to act for the Shipyard in matters pertaining to testing of all systems under the CTE's cognizance. The CTE shall coordinate efforts with those other elements of the Shipyard responsible for ship safety in the manner described in paragraph

2.2. The responsibility of the CTE to ensure ship safety through the execution of testing and work control is in no way diminished by the appointment of individuals responsible for overall ship safety. Individuals appointed as CTE or ACTE, who may act as an alternate to the CTE, shall be qualified and maintain qualification in accordance with the requirements of Appendix C. The CTE should not normally be assigned to a shift as an LTE while assigned as CTE. The following is a list of basic duties and responsibilities of a CTE. This list does not limit management's prerogatives in regard to assigning additional duties and responsibilities to a CTE, provided that such additional duties and responsibilities, if assigned, do not interfere with the duties and responsibilities listed herein. The CTE shall:

- a) Plan and schedule the test program for the assigned project.
- b) Coordinate the test program. Act as JTG chairman and issue reports of JTG meetings. An ACTE may be appointed in writing by the Shipyard manager responsible for testing to function as the JTG Chairman, under the direction of the CTE, for review and approval of test and operating procedures. This option does not diminish the responsibility of the CTE to ensure that satisfactory test documents are approved for use.
- c) Conduct test schedule meetings and issue the List of Authorized Tests (LAT) or equivalent at regular intervals dictated by the testing schedule.
- d) Ensure preparations for and the conduct of the test program meet all technical and safety requirements.
- e) Concur in schedules of testing and work that could affect testing.
- f) Maintain required documentation of the test program.
- g) Issue test documents.
- h) Maintain personal knowledge of the day-to-day progress and conditions of systems and of ship conditions, operations, and tests which affect the test program.
- i) Ensure test data is reviewed to ascertain if all specified requirements were met as soon as practicable after completion of the test. Formally identify data which does not meet all specifications as out-of-specification and initiate necessary actions to obtain a satisfactory resolution of the out-of-specification data.
- j) Ensure certification of individual systems or groups of systems is complete and ready for test and completion of all prerequisites and test preparation items will support testing prior to performing a test.
- k) Ensure all data is complete and satisfactory prior to recommending a significant change in system status (e.g., propulsion plant shutdown, or removal of major test support equipment upon completion of a series of integrated test operations).
- l) For those tests/operations relative to Shipyard work and testing having significant Ship's Force involvement, ensure proper briefings and training are conducted as necessary.
- m) Ensure LTE shift turnovers are complete, thorough, and in depth.

- n) Inform, in a timely manner, other Shipyard organizations of specific needs for instruments, special tools, and trade manpower to support the test program and the Shipyard's schedule.
 - o) Enforce adherence to the schedule for test procedure reviews to ensure test procedure preparation and issue do not become controlling to the test program. Tests that require JTG concurrence must be presented to JTG members with adequate time scheduled to support review.
 - p) Audit shipboard testing in progress and take action to ensure testing is performed in accordance with approved procedures.
 - q) Be responsible for the actions of all Shipyard personnel performing shipboard tests.
 - r) Ensure work control and tag-out are accomplished in accordance with references (c) and (d).
 - s) Be responsible to ensure systems are operated in accordance with approved operating procedures, test procedures, or component technical manual requirements when operations are being performed under the direction of the Shipyard.
 - t) Ensure Ship's Force and Outside Activities' (e.g., Alteration Installation Team (AIT), etc.) tasks (including tests) entered in the project database are reviewed to ensure proper scheduling.
 - u) Ensure all Shipyard (including Shipyard-hired outside activity) work has been reviewed for test requirements.
- (2) Lead Test Engineer(s) – (LTEs) - Each Shipyard is responsible to ensure Shipyard testing is accomplished safely. To accomplish this requirement, each Shipyard should develop operating instructions that prescribe when a LTE shall be on duty, and include these instructions in the test engineering operating procedures required by paragraph 4.2 of this manual. These policies should include those operations and tests that are complex and pose significant risk to personnel or equipment safety. LTEs shall be qualified in accordance with Appendix C. The duties of the LTE are as follows:
- a) The LTE is directly responsible to the CTE (or ACTE if assigned and when in charge) and is the CTE's on-the-scene representative to ensure that testing is properly conducted.
 - b) The LTE is in charge of the overall test program for the assigned shift and is responsible for its progress.
 - c) The LTE is responsible for ensuring timely actions are taken to place systems in a safe condition if abnormal or unexpected conditions or operating parameters occur during performance of testing or system operations.
 - d) The LTE shall ensure all testing or required operations performed during the assigned shift, are listed on the LAT and/or Ship Plan of the Day (SPOD). If testing or operations are not listed on the LAT, the LTE shall obtain a change to the LAT and/or SPOD before proceeding.

- e) The LTE coordinates testing to be conducted during the assigned shift with the Watch/Duty Officer.
 - f) The LTE shall ensure all prerequisites are satisfied prior to commencement of testing.
 - g) The LTE is responsible for preventing or stopping work or testing which could prevent safe performance of operations listed on the LAT and/or SPOD.
 - h) The LTE is responsible for conducting pre-shift and pre-event briefings as assigned.
 - i) The LTE shall have knowledge of key ship's system conditions and safety requirements as related to the tests to be performed during the assigned shift.
 - j) The LTE shall keep accurate LTE Logs and conduct thorough shift turnovers.
- (3) Test Directors (TDs) – TDs are assigned to specific ship's tests by the CTE and/or Production Code. TDs are responsible to the CTE or LTE consistent with the requirements of this manual. The TD shall be qualified in accordance with Appendix C. The duties of the TD include:
- a) The TD directs test operations, and ensures operations are performed in accordance with approved procedures.
 - b) The TD is directly responsible to the CTE (or LTE when assigned) and is the on-scene representative to ensure that testing is properly conducted.
 - c) The TD is in charge of the test assigned and is responsible for its progress.
 - d) The TD is responsible for initiating timely action to place systems in a safe condition and promptly notify the LTE/CTE if abnormal or unexpected conditions or operating parameters occur during performance of testing or system operations.
 - e) The TD shall ensure all testing or required operations that will be performed during the assigned shift, are listed on the LAT and/or SPOD. If testing or operations are not listed on the LAT, the TD shall not proceed before obtaining an approved change to the LAT and/or SPOD.
 - f) The TD shall ensure all prerequisites are satisfied and shall brief the LTE (when assigned) and Ship's Watch/Duty Officer of test status.
 - g) The TD is responsible for preventing or stopping work or testing which could prevent safe performance of operations listed on the LAT or SPOD.
 - h) The TD shall ensure the personnel supporting the test are briefed on the requirements for performance of the test.
 - i) The TD shall conduct thorough shift turnovers regarding test progress.

2.3.2 Ship's Force. Ship's Force is responsible to:

- a. Assign a member and one or two alternates to the JTG, in writing.
- b. Provide information on Ship's Force work evolutions and testing.
- c. In the event abnormal or unexpected operating parameters occur on systems that could affect the test program, place the system in a safe condition and promptly notify the LTE/CTE.
- d. Maintain and operate in-service systems that have not been operationally transferred to the Shipyard, and maintain and operate new construction, temporary, altered, or repaired systems that have been operationally transferred from the Shipyard.
- e. Direct that evolutions be stopped if testing or operations are not considered to be progressing in a safe manner and in accordance with applicable procedures.

2.3.3 NAVSEA Shipyard Representative's Office (NSRO). NSRO responsibilities apply only to those availability test programs where a JTG member is assigned in writing. When assigned, one or two alternates should also be assigned. NSRO is responsible to:

- a. Provide independent oversight of testing and ship safety for COMNAVSEA.
- b. Direct evolutions be stopped if testing or operations are not progressing in a safe manner and in accordance with applicable procedures.

2.3.4 Supervisor of Shipbuilding, Conversion, and Repair (SUPSHIP) or Regional Maintenance Center (RMC) (when ship is in a private Shipyard). SUPSHIP/RMC is responsible to:

- a. Assign a member and one or two alternates to the JTG, in writing.
- b. Provide oversight of testing and ship safety.
- c. Direct evolutions be stopped if testing or operations are not considered to be progressing in a safe manner and in accordance with applicable procedures.

2.4 JOINT TEST GROUP (JTG).

2.4.1 General. The Joint Test Group (JTG) is a term used to describe collectively the persons assigned by their parent organizations to take required local approval actions for a test program. Where multiple CTE's have been assigned, the CHENG (senior engineering manager in a private Shipyard with SUPSHIP CHENG concurrence) shall determine the lead (CTE-HM&E is the default lead) CTE and associated JTG, and number and area of cognizance of the JTG(s). The JTG facilitates local approval of documents for administration, performance, and acceptance of testing and communications among the responsible organizations. JTG decisions are to be documented by the Shipyard, concurred in by all members of the JTG, and distributed to all JTG members.

2.4.2 Members. The JTG(s) consists of one member, designated in writing, from each of the following organizations:

- a. Shipyard - The Shipyard CTE for that ship (or area of cognizance for that ship), who serves as chairman.
- b. Ship's Force (designated by ship's Commanding Officer).

- c. NAVSEA Shipyard Representative's Office (Naval Shipyard availabilities; when assigned).
- d. SUPSHIP (private Shipyard availabilities).
- e. Other organizations that have significant work and test may also assign a member as agreed upon by the JTG. Each organization represented on the JTG(s) is further required to designate in writing one or two qualified alternates.

2.4.3 Responsibility and Authority. The members of the JTG(s) or other representatives of the parent organizations assigned to monitor system operations have authority and responsibility to:

- a. Stop an operation at any time an unsafe or potentially unsafe system or ship condition exists.
- b. Have additional entries made in Shipyard logs or records of events concerning testing or operations whenever corrections or additions are considered necessary to accurately record events which occurred.
- c. Advise the Shipyard of those operations which will be monitored and require the Shipyard to commence an operation to be monitored only when the monitoring personnel are present on scene and concur in starting the operation.
- d. Concur with the LAT.
- e. Concur in test procedures which could affect ship conditions and ship safety.
- f. Review all outstanding work and test procedures prior to key events in accordance with references (b), (e) and (f), as applicable, and as designated by the CTE.

SECTION 3 TEST PLANNING

3.1 GENERAL. The CTE is responsible for all aspects of the administration of the test program from advanced planning to certification. This section is focused on the technical planning associated with the test program. The purpose of the test program is certification of ship systems on which the Shipyard performed work. Unless otherwise specified in the Availability Work Package (AWP), the test program shall be scoped to cover the work assigned to the Shipyard. The customer must approve expanding the scope of testing to cover work accomplished by other activities (e.g., Outside Activities, Ship's Force) or to test where no work was performed.

3.2 WORK PACKAGE REVIEW AND DEVELOPMENT.

3.2.1 Conduct a review of the AWP to ensure that mandatory test and operational requirements are included and the test program can be properly executed within the scheduled availability duration. Any concerns or omissions will be discussed with the Shipyard Business Agent for resolution with the applicable customer.

3.2.2 Conduct a review of the Pre-Availability Testing and Technical Assessment Plans so required work will be identified to decrease the risk of equipment failures which will affect execution of testing and possibly delay availability completion.

3.2.3 Identify long lead special test and support equipment to facilitate timely procurement or fabrication to support operational and testing schedules.

3.3 TEST REQUIREMENTS IDENTIFICATION AND SEQUENCING.

3.3.1 Test Identification. The Shipyard shall ensure all work is evaluated for test requirements and is formally documented linking the work to the required testing. The Shipyard shall be able to provide a list of those test procedures that are SUBSAFE, Scope of Certification or could affect ship conditions.

3.3.2 Test Sequence/Schedule. The test sequence/schedule is normally contained and maintained within the project schedule.

- a. The test sequence/schedule consists of tests, or parts of tests, and significant events for each ship arranged in order of performance. To provide flexibility for scheduling and managing test program performance, individual tests which are prerequisites for a particular test or key event and which are not interdependent, may be arranged in parallel.
- b. The Shipyard shall prepare an integrated test sequence/schedule plan. The plan shall include, on a time-line, if feasible, all tests that must be accomplished leading up to undocking, propulsion plant testing, Combat Systems assessment, dock trials, fast cruise, sea trials, and completion, as applicable. The schedule shall include tests performed by the Shipyard, Ship's Force and Outside Activities. The schedule shall clearly show:
 - (1) Key prerequisites for the test
 - (2) Sequence of tests
 - (3) Activity responsible for conducting the test(s)

- (4) Nuclear testing and other events which affects the performance of non-nuclear testing
- (5) The planned start and completion dates of each test procedure.

c. Test sequences/schedules shall be kept current with the progress of testing.

3.4 TEST PROCEDURE DEVELOPMENT.

3.4.1 In-Shop Testing. The cognizant production shop may perform in-shop testing in accordance with a technical work document. Local instructions shall provide requirements for witnessing, review, and approval. In-shop tests avoid the need for shipboard hydrostatic testing, provide assurance of proper work accomplishment, minimize subsequent delays associated with rework from shipboard testing and facilitate inspections which could be difficult to perform shipboard, etc.

3.4.2 Shipboard Testing in Technical Work Documents. Shipboard testing may be included in technical work documents and controlled as work if it can be safely performed without test organization controls. Consider the following:

- Effect on ship safety and ship conditions.
- Evolution complexity.
- Limited Ship's Force involvement.
- Need for formal lineups.

3.4.3 Preparation of Test Procedures for Shipboard Use

a. Test Procedures are the basic documents of the test program. They specify prerequisites, ship conditions, system status, special equipment, precautions, and the steps to be followed during conduct of the test. A written test procedure is required for all shipboard tests not controlled as part of a work/repair document. All test procedures shall be uniquely numbered, shall refer to the applicable test specifications, required test equipment, referenced drawings, and provide a means of identifying those test procedures which are SUBSAFE, Scope of Certification or could affect ship conditions. The format of the test procedure shall be as simple as practicable and shall describe in concise statements the extent and method of conducting the test. Each test procedure shall:

- (1) Meet NAVSEA requirements.
- (2) Be self-contained to the maximum extent practicable for ease of execution – avoid reference to other documents.
- (3) Provide detailed descriptions of the test operations to be performed and the pass/fail criteria of each operation. Sufficient detail shall be provided to ensure that the system or component is thoroughly tested to the extent necessary to support certification of the accomplished repairs.
- (4) Include data sheets with spaces provided for recording results of tests, date, name or number of ship, label plate data necessary for the conduct of the test, and signature of data taker/witness. If a separate test data form is used, it shall include test pressure, or an approved test pressure code if pressure is confidential, test boundaries, duration of test and point where test pressure was applied.

- (5) List all valves and valve positions within and including the test boundaries being tested.
 - (6) Include required procedures for safety of personnel and equipment.
 - (7) Be marked appropriately when identified as a SUBSAFE or Scope of Certification document.
- b. When available, use NAVSEA standard test procedures. No technical changes shall be made to NAVSEA approved standard test procedures except as approved by NAVSEA. The Shipyard has the latitude to add local requirements/instructions, and incorporate the Standardized Test Procedure requirements into local test procedures broken down to support scheduled events. Test procedure changes that do not compromise system functions, deviate from specifications, or change the test procedure purpose do not require NAVSEA approval.

3.5 TEST PROCEDURE REVIEW AND ISSUE.

3.5.1 The Shipyard shall perform a review of each locally prepared and/or NAVSEA standardized test procedure prior to issue for required concurrences. All objections to the test procedure shall be resolved prior to issue.

3.5.2 The Shipyard shall conduct a review of each test procedure to identify those test evolutions that could affect ship safety or ship conditions. The JTG(s) shall perform a comprehensive review and concur in test procedures that could affect ship safety or ship conditions 3 weeks prior to the start of the test, except for testing of an emergent nature where test procedures should be processed as quickly as possible.

3.5.3 Issue test procedures early enough to provide time for:

- Any required approvals.
- Procurement of special test equipment and instrumentation.
- Necessary training.
- Members of the JTG(s) and other applicable Shipyard and Ship's Force personnel to review and become familiar with the test procedures prior to start of the test.
- Resolution of comments resulting from such reviews.

3.5.4 Concurrences shall also be obtained and documented from those organizations involved with the safe conduct of the testing and interface issues (e.g., Nuclear, RADCON, Environmental, Occupational Safety, etc.).

3.6 TEST PROCEDURE CHANGES.

3.6.1 A formal change process shall be established via local instructions for development and processing of test procedure changes similar to test procedure development requirements of section 3.4. Each change shall receive an independent review. The JTG shall review and concur in the change when a test evolution has been added or changed that could affect ship safety or ship conditions. A change notice shall be used to issue and document any required concurrence with the change.

3.6.2 Normally, changes to test procedures shall be issued as whole page changes. Some corrections can be accomplished on the official copy of the test procedure by use of "pen and ink". A "pen and ink" change can be made if the change does not affect the test criteria, scope, boundaries, or certification unless accompanied by a formal change prior to test certification.

SECTION 4 SHIPBOARD TEST EXECUTION

4.1 GENERAL. This section addresses procedures, processes and responsibilities for management and safe execution of the non-nuclear shipboard test program. Although completion of in-shop testing at the component level is an attribute associated with the overall ship's test program, execution of this testing is performed by the cognizant production activity as part of the shop repair processes and is not discussed in this section. The CTE(s) through oversight and direct reports is ultimately responsible for execution of the non-nuclear test program.

4.2 TEST ENGINEERING OPERATING PROCEDURES.

4.2.1 The Shipyard shall have local operating procedures to define the processes and tools utilized to manage the shipboard test program. The following is a minimum list of required operating procedures:

- a. Work to Test Relationships
- b. List of Authorized Tests (LAT)
- c. Nuclear/Non-Nuclear/C/S Interface
- d. LTE Logs/Shift Turnover
- e. Pre-Shift/Event Briefings
- f. Test Failure Reports and Analysis
- g. Test Interruptions, Unusual Occurrences and Course of Action Processes

4.2.2 These operating procedures may be integrated with Shipyard instructions and manuals that establish these requirements. Where these exist, duplication is not required.

4.2.3 The Shipyard shall identify which operating procedures involve participation of Ship's Force during the specific availability and shall provide appropriate training to Ship's Force on their content prior to use.

4.3 TEST READINESS MEETINGS AND REVIEWS.

4.3.1 The CTE is responsible for conducting periodic test readiness reviews and meetings. These reviews will utilize data established by work to test relationships as well as reviews of emergent technical work instructions and work control documents to determine the plan for near term testing. In addition, status of testing scheduled for performance in a relatively short window (e.g., 2 - 4 weeks) should also be reviewed during these meetings to ensure issues associated with the scheduled start and finish dates are discussed and resolutions identified.

4.3.2 These meetings will serve to review the status of outstanding pre-requisite production work, test preparations, test failure resolution and other actions necessary to proceed with the test performance. The CTE should ensure that appropriate personnel such as cognizant Production Managers, Engineering Personnel and Ship's Force are in attendance.

4.3.3 The CTE is responsible for the preparation of the Test Readiness Listings. The CTE or the CTE's designated representative shall prepare, review and validate the test readiness list(s). The creation and review of test readiness list(s) shall be accomplished for all shipboard testing except for pre-availability and sea trial testing and testing of minor scope that the CTE determines is not warranted.

4.4 EVENT READINESS MEETINGS AND REVIEWS.

4.4.1 To support key event management, the CTE is responsible for creating, reviewing and validating Event Readiness Listings to support major project key events. Event Readiness Listings include items that are required to be complete to meet minimum technical requirements to support the test or key event. The CTE is responsible for non-nuclear technical requirements to support project key events.

4.4.2 The JTG(s) is responsible to review and concur on all items that will remain outstanding for a key event as specified in paragraph 2.4.3.f of this manual. In addition, the JTG(s) shall concur on the list of key events.

4.5 LIST OF AUTHORIZED TESTS (LAT). A list of tests authorized for accomplishment during a specified period of time shall be prepared and issued. The list shall be prepared under direction of the CTE and approved by the JTG. As a minimum, the following attributes shall be included:

- Ship name and hull number.
- Date of list approval.
- Time period covered.
- List of all tests (including reference to the specific procedure and revision to be used) to be conducted during the specified time.
- Test unique serial numbers.
- Annotation of those tests that affect ship conditions and ship safety.
- JTG test execution approval signatures.

4.6 REVIEW OF TEST PROCEDURES PRIOR TO PERFORMANCE. The Shipyard shall conduct a comprehensive review of all test procedures prior to the scheduled performance date to ensure that:

- Planning for both personnel and equipment is adequate.
- Test procedure is applicable and current.
- Required prerequisites (includes pre-test inspections and deficiency correction) are complete.
- Compatibility of system status and conditions (includes tag-outs) are adequate.
- Special test equipment is available.
- All applicable documents are available.

4.7 PREREQUISITE LISTS. For key events in a test program, prerequisite lists shall be prepared to specify the requirements to be satisfied in order to ensure readiness to perform the event. Prerequisite lists shall be prepared for the principal reactor plant evolutions specified in references (e) and (f), as applicable. Prerequisite lists shall be prepared by the activity responsible for the evolution. Prerequisite lists may be contained in any official directive. The members of the JTG(s) shall concur with the prerequisite lists.

4.8 INTERFACE INTEGRATION. The CTE is responsible to ensure work associated with Hull, Mechanical and Electrical (HM&E) Systems and C/S are properly sequenced and prioritized with nuclear, AIT and other contracted work and testing. When there is no single CTE in charge, the Hull responsible CTE shall ensure priorities are established with common goals and clear expectations, particularly when competing actions are associated with Ship's Force or production support requirements, by maintaining

communication with the applicable Nuclear, Mechanical, Electrical, C/S CTE/ACTE and Outside Activity representatives. The Shipyard shall establish methods to document and convey the agreed upon priorities associated with work, work control, testing and other requirements for specific periods of time.

4.9 LEAD TEST ENGINEER (LTE) LOGS.

4.9.1 The Shipyard shall establish requirements for LTE Logs with content and format for reporting the status of test and work control evolutions on a shift by shift basis. The logs are intended to provide a record of actions completed, problems encountered and instructions for follow-on shifts to ensure orderly continuation of testing and other evolutions.

4.9.2 The LTE Log content should include all pertinent testing, operations and associated work control, and pertinent system conditions as scheduled and completed during the shift. The information presented should be a complete, accurate and informative account such that subsequent reviewers can evaluate the status of actions/system conditions and evaluate for follow-on actions. This does not include data required to be recorded within a test procedure.

4.10 PRE-SHIFT/EVENT BRIEFINGS.

4.10.1 Throughout a ship's availability, LTEs shall be responsible to conduct pre-shift and/or pre-event briefings. These briefings provide an important forum to discuss and explain the planned testing or events to be performed, review the detailed procedures to be followed, effects on or requirements with respect to plant and ship conditions, roles and responsibilities of involved parties, interface with other tests or events and to ensure the planned actions are conducted safely and in accordance with prescribed procedures and requirements. Further, these briefings provide the opportunity to identify the LTE responsible for non-nuclear evolutions during the shift and emphasize the LTE role as sole point of contact for all non-nuclear actions or issues during the shift or for the evolution being briefed.

4.10.2 Pre-shift briefings are normally conducted in conjunction with Nuclear Engineering as part of the preparation for and conduct of principle reactor plant test evolutions, as defined in references (e) and (f). LTE participation in and conduct of pre-shift briefings is mandatory during integrated propulsion plant testing evolutions (Critical Operations, Hot Operations, Integrated Propulsion Plant Test Program, Non-Critical Steaming, etc.) for any shift during which non-nuclear cognizant testing and other evolutions are planned.

4.10.3 Pre-event briefings are similar in scope and purpose to pre-shift briefs except they are conducted during periods outside of nuclear interface testing. Pre-event briefings are required whenever the complexity of testing or evolutions warrant close coordination and a detailed briefing of responsibilities and procedures is necessary to ensure safe and proper execution. Examples of evolutions typically warranting pre-event briefs include steam outages, initial pressurization of high energy systems, major electric plant manipulations, compartment completion testing and other times as deemed necessary by the CTE.

4.11 TEST INTERRUPTIONS, UNUSUAL OCCURRENCES AND COURSE OF ACTION PROCESS.

4.11.1 The Shipyard shall have a procedure that establishes requirements for handling interruptions, unusual occurrences, and problems that occur during testing, work control and other operations. This procedure shall address interface with the critique process and reference (g), and include the following details:

- What constitutes a test interruption and unusual occurrence.
- The steps required to recover from a test interruption or other unusual occurrence.
- Written reports required to document problems.
- Method of voiding completed prerequisites, plant conditions, procedural steps, valve/switch lineups, and data sheets affected by the interruption and manner of re-verification and documenting re-performance of the items before resuming testing, work control or other operations.
- Requirements to be satisfied and necessary approvals required to resume testing, work control or other operations including, when warranted based on the severity of the problem, requirements for preparation and execution of a Course of Action (COA) for approval by members of the JTG. The COA shall summarize the circumstances that led to the occurrence, the problem(s) identified, the cause(s) of the problem(s), and the short-term actions necessary to resume testing or operations. Long-term actions should be addressed in other documents such as critique reports.

4.12 CERTIFICATION OF COMPLETED TEST PROCEDURES. The CTE is responsible to ensure that completed test procedures are reviewed and certified to be accurate and complete. This review should include assurance that the test was completed as intended and in accordance with the prescribed requirements, and that the data recorded is within the required specifications.

4.13 METRICS. The Shipyard shall establish requirements for collection and analysis of data associated with:

- Test Performance
 - Test Performance Errors
 - Compliance with Schedule
- Work Control Performance
 - Work Authorization Problems
 - Tag-out Problems
- Test Failures
 - Material Deficiencies
 - Workmanship Deficiencies

4.14 RELIABILITY TESTING. Steam and electric plant reliability testing shall be performed to subject the nuclear propulsion plant to operational conditions closely simulating those normally expected during subsequent reactor plant critical testing evolutions, thereby precluding late identification of deficiencies that would not normally be found until actual performance of those evolutions. This reliability testing shall be performed in conjunction with and during the hot operations and engine room steaming phases of the Integrated Propulsion Plant Test Program, operations supporting Shipyard re-tests, or Ship's Force training evolutions.

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APPENDIX A
LIST OF ACRONYMS

<u>ACRONYM</u>	<u>DEFINITION</u>
ACTE	Assistant Chief Test Engineer
AIT	Alteration Installation Team
C/S	Combat Systems
CHENG	Chief Engineer
CNO	Chief of Naval Operations
CTE	Chief Test Engineer
HM&E	Hull, Mechanical and Electrical
JTG	Joint Test Group
LAT	List of Authorized Tests
LTE	Lead Test Engineer
NAVSEA	Naval Sea Systems Command
NSA	Naval Supervising Activity
NSRO	NAVSEA Shipyard Representative's Office
RADCON	Radiological Control
RMC	Regional Maintenance Center
SPOD	Ship Plan of the Day
SUBSAFE	Submarine Safety Program
SUPSHIP	Supervisor of Shipbuilding, Conversion and Repair, USN
TD	Test Director

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APPENDIX B**GLOSSARY OF TERMS**

<u>TERM</u>	<u>DEFINITION</u>
Assistant Chief Test Engineer (ACTE)	Paragraph 2.3.1.b(1).
Chief Test Engineer (CTE)	Paragraph 2.3.1.b(1).
Combat Systems	Those systems normally in (but not limited to) the 400 and 700 series Ship Work Authorization Boundaries (SWABs).
Hull, Mechanical and Electrical	Those systems in the 100, 200, 300 and 500 series SWABs.
Joint Test Group (JTG)	Paragraph 2.4.
Lead Test Engineer (LTE)	Paragraph 2.3.1.b(2).
NAVSEA Shipyard Representative's Office (NSRO)	NAVSEA's representative in the Shipyard.
Prerequisite List	List of requirements to be satisfied prior to performing an event or evolution.
Ship Class	The terms "ship class" and "class of ship" refers to the general configuration groups (e.g., SSN 688 class submarine, CVN 68 class aircraft carrier, etc.).
Ship Conditions	The status of ship parameters: buoyancy, list, trim, stability, and watertight integrity.
Shipyard	The organization responsible for the construction, overhaul or repair of a Navy ship and overall administration and performance of all aspects of the test program.
Shipyard Test Organization(s)	Paragraph 2.3.1.
Ship's Force	Personnel assigned to the ship who are currently qualified in accordance with BUPERS Instruction 1540 (series) (or other approved Navy directives applicable to the particular ship) for duty in connection with supervision, operation, and maintenance of ship systems.

Ship Safety	Maintaining the control of ship conditions and preventing and controlling fire and flooding.
System Conditions	The status of principal system parameters and conditions (for example, steaming, shutdown, drained, filled, fresh water lay-up, etc.).
System Status	The compilation of individual system lineups in effect for a system at a specific time or for a specific reason. The specific lineup of system valves, circuit breakers, fuses, blank flanges, etc., in sufficient detail for each work item to be performed or to assure the scheduled testing or work can be accomplished safely.
Test Program	Any and all testing performed on a ship's systems.

APPENDIX C

PERSONNEL QUALIFICATIONS

1. GENERAL. The purpose of this section is to establish uniform standards for training and qualifications of Chief Test Engineers (CTEs), Assistant CTEs (ACTEs) who may act as an alternate to the CTE, Lead Test Engineers (LTEs), and Test Directors (TDs). Each Shipyard is responsible for the training and qualification of the above personnel used by that Shipyard.

1.1 ASSIGNMENT OF CHIEF AND LEAD TEST ENGINEERS. LTEs are assigned by the Shipyard manager responsible for the testing to provide supervision during each shift of testing or operations described in Section 2. Except as noted below, an individual assigned as CTE, ACTE who may act as an alternate to the CTE, or LTE, shall meet the requirements of this section to qualify and maintain qualification as an LTE on the ship class that individual is supervising. For an unanticipated commissioned ship availability, personnel qualified on a different ship class may be assigned as CTE, ACTE who may act as an alternate to the CTE, or LTE provided the Shipyard ensures such personnel receive sufficient training on applicable systems and procedures prior to assignment. The Shipyard is additionally responsible to ensure sufficient numbers of LTEs for each applicable ship class and that the LTEs maintain other qualifications that require separate training (e.g., for asbestos removal, emergency breathing equipment, dosimetry) in order to permit shipboard access and duties.

1.2 USE OF PERSONNEL AND TRAINING AT OTHER SHIPYARDS.

- a. Arrangements may be made by a Shipyard to obtain the classroom training or practical experience required by this section for their employees at another Shipyard where such training is more readily available. When training is obtained at another Shipyard, the candidate's home Shipyard will obtain documentation outlining specifically what training was accomplished from the Shipyard where the training was conducted.
- b. A Shipyard may use personnel qualified as LTEs/TDs from another Shipyard. In that case, the Shipyard to which such personnel are assigned is responsible for ensuring that they are adequately prepared to perform assigned duties at that Shipyard. As a minimum, the Shipyard using qualified personnel on loan shall indoctrinate them on administrative procedures and special casualty bills in effect. Any weaknesses identified by this indoctrination shall be corrected prior to their assignment of duty.

1.3 PERIODIC REPORT OF LTE QUALIFICATION. Biennially, one copy of a report on LTE qualification status shall be forwarded to NAVSEA 04XQ for information. This report shall indicate the ship class(es) on which each LTE, ACTE who may act as an alternate to the CTE, and CTE is currently qualified.

1.4 ASSIGNMENT OF TEST DIRECTORS. The Shipyard shall establish a training and qualification program consistent with the specific duties and responsibilities of the individual TD. The senior official responsible for testing shall ensure such personnel meet the qualification requirements prior to that individual being assigned as a TD shipboard.

1.5 MISCELLANEOUS. If at any time, the Shipyard determines that an individual is not qualified to discharge the duties and responsibilities of a LTE or TD, the qualification of that individual shall be revoked. Re-qualification may be made after the cause for revoking qualification has been corrected.

2. INITIAL QUALIFICATION PROGRAM FOR LEAD TEST ENGINEERS.

2.1 SHIP SYSTEMS TRAINING. This training is given to provide a basic understanding of the applicable portion of the ship to which qualification is being sought. This training should include at least 240 hours of lecture presentations and classroom work utilizing the appropriate ship's manuals as the basic textbooks. The training program should also include mechanical and electrical theory (thermal and hydraulic design principles). Specific additional topics covered should be based on the area of cognizance of the candidate (e.g, C/S, HM&E, etc.). Training on administrative requirements, such as procedures to be used for controlling valve and electrical lineups, will be included. The training may be modified based upon a review of prior work experience and training, and this equivalency must be justified in sufficient detail in the individual's training record.

2.2 CLASSROOM COURSE FINAL WRITTEN EXAMINATION. After satisfactory completion of the ship systems or its modified training, the Shipyard shall administer a comprehensive or modified written examination(s), respectively, per paragraph 6. If the ship systems classroom training was completed at another Shipyard, the home Shipyard's final written examination (as well as the final written examination discussed in paragraph 2.3 below) may be administered at the training Shipyard. (Administrative requirements, however, should be examined only at the home Shipyard.) If the home Shipyard's final written examination is to be administered by the training Shipyard, the home Shipyard shall review the content and grading of the training Shipyard's examination.

2.3 PRACTICAL EXPERIENCE AND SHIPBOARD TRAINING. To provide practical experience and shipboard training, LTE candidates are required to observe and participate in ship operations and testing in a capacity directly under the supervision of a qualified LTE. The Shipyard LTE initial qualification practical experience and shipboard training program shall meet the following requirements:

- a. LTE candidates are required to observe and participate in a sufficient number of varied ship operations and testing events to prepare them adequately for actual LTE assignment and all related LTE duties. This training period shall include LTE candidate assignment during preparation for ship work, required non-nuclear testing for ships' undocking, steaming (as applicable), as well as preparation for other LTE duties (e.g., pre-watch tours, briefings, watch relief, providing isolation for work, work authorization, test administration and control). A formal checklist should be used to verify that each individual participates in selected tests, evolutions, and tasks.
- b. LTE candidates may accumulate shipboard experience in any Shipyard availability covered by this manual; however, an effort should be made to limit the movement of an LTE candidate from one ship class to another while gaining practical experience, since this could cause a loss of continuity and reduce the effectiveness of the training experience.
- c. Each LTE candidate shall accumulate a minimum of three (3) months of practical experience and shipboard training. This minimum requirement may be reduced for LTE candidates who have obtained prior shipboard experience, provided a Shipyard evaluation of a candidate's knowledge and experience concludes that such a reduction is merited.
- d. LTE candidates shall accumulate at least five (5) shifts of experience in directing daily responsibilities, tests or evolutions under the direction of a qualified LTE. The formal checklist shall specifically indicate which tests or evolutions were directed by the LTE candidate.

- e. Before an LTE candidate can be nominated for final examination and certification, the candidate's watch standing performance, based on the practical experience and shipboard training received, shall be evaluated by the Shipyard and determined to be satisfactory.

2.4 CERTIFICATION OF QUALIFICATION. For pre-existing qualified personnel, final certification shall be accomplished after review of the individual's prior work experience and training with the equivalency documented in the individual's training record, and upon successful completion of an interview with the senior Shipyard manager responsible for testing. For non-pre-existing qualified personnel, a final oral examination shall be administered per paragraph 6.2 after satisfactory completion of the requirements of paragraphs 2.1, 2.2 and 2.3, passing a written examination per paragraph 6.1 on administrative requirements related to testing (examination may be administered separately or may be included as part of the examination required by paragraph 2.2), and when the Shipyard considers the candidate is qualified to discharge the duties and responsibilities of an LTE. Final certification shall be accomplished after the successful completion of the final oral examination.

3. SUBSEQUENT QUALIFICATION ON OTHER SHIP CLASSES.

3.1 GENERAL. A previously qualified LTE may qualify on another ship class by satisfactorily completing the requirements specified in this section on the ship class for which qualification is being sought. Opportunities to sight shipboard systems, arrangements or evolutions to complement lecture and classroom training provided in the training required by paragraph 3.2 should be considered, especially where the ship systems have significant differences from which the individual has been qualified. Qualifications for each ship class are maintained as described in paragraph 5.

3.2 SHIP SYSTEMS TRAINING. This training should be given to provide knowledge and understanding of the design and operation of the ship class for which qualification is being sought. The training can be similar to that for initial qualification or specific training which emphasizes the differences between the particular class being studied and other classes for which the LTE holds current qualification. This course should include lecture presentations and classroom or shipboard work utilizing the applicable manuals for the ship class.

3.3 SHIPYARD FINAL WRITTEN EXAMINATION. After satisfactory completion of the training described in paragraph 3.2 above, the Shipyard shall administer a written examination per paragraph 6.

4. CERTIFICATION OF INITIAL QUALIFICATION AND/OR REQUALIFICATION. After a Shipyard evaluation concludes that the individual is qualified to discharge the duties and responsibilities of LTE on the applicable ship class, the senior Shipyard manager responsible for testing shall certify so in writing.

5. MAINTAINING QUALIFICATION/CONTINUAL TRAINING. The Shipyard is responsible for ensuring that LTEs receive sufficient refresher training, as necessary, to maintain proficiency in the conduct of safe and proper ship operations and testing.

6. EXAMINATION PREPARATION, SECURITY, ADMINISTRATION AND GRADING. The following requirements apply for written and oral examinations:

- a. Examinations shall be prepared, administered and graded in a manner that avoids compromise.
- b. The Shipyard shall ensure that examination and reexamination questions for a particular ship class are sufficiently varied from examination to examination to ensure unpredictability.

- c. Each question and answer key shall be reviewed prior to use to ensure that all changes to applicable manuals have been incorporated.
- d. The results of the examination shall be discussed with each examinee.
- e. Except for Shipyard written examinations required by paragraph 2, refer to paragraph 6.3 if the examinee's performance on the examination is determined to be unsatisfactory.

6.1 WRITTEN EXAMINATIONS. The following requirements apply to the Shipyard written examinations and reexaminations required in paragraph 2.2, paragraph 2.4, and paragraph 3.3:

- a. The examination shall be administered to verify the individual's knowledge of applicable engineering principles and procedures and understanding of abnormal situations and casualties are sufficient to properly supervise, or continue to supervise, operations and testing on the applicable ship class.
- b. The senior Shipyard manager responsible for testing shall approve the examination.

6.2 ORAL EXAMINATIONS. The following requirements apply to the Shipyard oral examinations and reexaminations required in paragraph 2.4:

- a. Questions will test the examinee's overall knowledge of the non-nuclear systems and judgment by eliciting reactions to postulated scenarios. The examinee's knowledge of procedures for administering and controlling shipboard testing, and responsibilities of the various organizations involved, should also be examined.
- b. Leading questions will not be asked, except when necessary to probe weaknesses exhibited by an examinee during the oral examination.
- c. Each board member shall be prepared to participate in questioning and to evaluate the examinee's responses for each question. The examinee's LTE training records for training received at the examining Shipyard shall be available to the oral board members.
- d. The NSR (Naval Shipyards) or SUPSHIP/RMC (private Shipyards) shall be invited at least one week in advance of each oral examination. The examinee's LTE training records for training received at the examining Shipyard shall be available to the NSR or SUPSHIP/RMC as applicable.
- e. Senior Shipyard non-nuclear engineering manager (Chief Engineer and/or the Engineering and Planning Officer at Naval Shipyards) shall be invited and periodically monitor the conduct of the oral examinations.
- f. Boards administering oral examinations will consist of the following:
 - (1) Chairman - Senior Shipyard manager responsible for testing.
 - (2) A CTE qualified on that ship class.
 - (3) Other specialists designated by the senior Shipyard manager responsible for testing.
 - (4) NSR Office member (Naval Shipyards) or SUPSHIP/RMC (private Shipyards).

- g. The oral examination shall be formal and of sufficient duration to establish the candidate's qualification as a LTE. It will not be less than one hour in length.
- h. Each official oral board member shall participate in the questioning during an oral examination and shall be in attendance during the entire examination.
- i. Official board members shall individually and in writing provide their determination, as to whether the examinee passed or failed, to the senior Shipyard Manager board member. Unanimous agreement of the official board members that the examinee passed is required for the examinee's performance on the examination to be considered satisfactory.

6.3 FAILURE OF EXAMINATIONS. An individual whose performance is unsatisfactory on a Shipyard written examination required by paragraph 3.3, or an oral examination required by paragraph 2.4, will be eligible to take a reexamination after undergoing additional training to correct weaknesses. Topic coverage on written reexaminations will be determined by the Shipyard based on a review of examinee performance on the failed examination.

7. RECORDS. Shipyards shall retain the records of LTE qualification for the period of the individual's qualification. Records shall be made available to NAVSEA upon request.

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